

## GRADE GAP ANALYSIS OVERVIEW

No information from the foundation boxes was used in the creation of this report.

Teacher Respondent Topic	# reviewed
Structure and Properties of Matter	8
Chemical Reactions	7
Forces and Interactions	4
Energy	5
Waves and Electromagnetic Radiation	5
Total	29

Alignment			
No Alignment	Weak Partial Alignment	Strong Partial Alignment	Complete Alignment

### Responses From:

Meeting Location	Structure and Properties of Matter	Chemical Reactions	Forces and Interactions	Energy	Waves and Electromagnetic Radiation
Great Falls October 3 <sup>rd</sup>					
Kalispell November 7 <sup>th</sup>	1		1		
Missoula/Lolo November 8 <sup>th</sup>	2	2			
Miles City November 13 <sup>th</sup>	2	3	1		1
Red Lodge November 14	3	1			1
Billings November 15					
Bozeman December 3 <sup>rd</sup>				1	
Missoula/Lolo December 6 <sup>th</sup>		1		1	
Great Falls December 10 <sup>th</sup>			1	2	2
Shelby December 11 <sup>th</sup>			1		
Glasgow December 12 <sup>th</sup>				1	
Havre December 13 <sup>th</sup>					1
Total	8	7	4	5	5



## Structure and Properties of Matter

<b>Total respondents:</b>	<b>8</b>
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<b>Montana Science Content Standard 1</b> Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate the results and form reasonable conclusions of scientific investigations.	<b>HS-PS1-1.</b>	<b>HS-PS1-3.</b>	<b>HS-PS1-8.</b>	<b>HS-PS2-6.</b>	<b>Total</b>
1. Generate a question, identify dependent and independent variables, formulate testable, multiple hypotheses, plan an investigation, predict its outcome, safely conduct the scientific investigations, and collect and analyze the data	2	7	3		12
2. Select and use appropriate tools including technology to make measurements (in metric units), gather, process and analyze data from scientific investigations using appropriate mathematical analysis, error analysis, and graphical representation	1	5	1	1	8
3. Review evidence, communicate and defend results, and recognize that the results of a scientific investigation are always open to revision by further investigations. (e.g. through graphical representation or charts)		4	1	5	10
4. Analyze observations and explain with scientific understanding to develop a plausible model (e.g., atom, expanding universe)	3	1	5		9
5. Identify strengths, weaknesses, and assess the validity of the experimental design of an investigation through analysis and evaluation		2	1		3
6. Explain how observations of nature form an essential base of knowledge among the Montana American Indians	1				1
<b>Montana Science Content Standard 2</b> Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	<b>HS-PS1-1.</b>	<b>HS-PS1-3.</b>	<b>HS-PS1-8.</b>	<b>HS-PS2-6.</b>	<b>Total</b>
1. Describe the structure of atoms, including knowledge of (a) subatomic particles and their relative masses, charges, and locations within the atom, (b) the electrical and nuclear forces that hold the atom together, (c) fission and fusion, and (d) radioactive	7	3	6	2	18
2. Explain how the particulate level structure and properties of matter affect its macroscopic properties, including the effect of (a) valence electrons on the chemical properties of elements and the resulting periodic trends in these properties, (b) chemical bonding, (c) molecular geometry and intermolecular forces, (d) kinetic molecular theory on phases of matter, and (e) carbon-carbon atom bonding on biomolecules	8	5	2	4	19
3. Describe the major features associated with chemical reactions, including (a) giving examples of reactions important to industry and living organisms, (b) energy changes associated with chemical changes, (c) classes of chemical reactions, (d) rates of reactions, and (e) the role of catalysts	1	1		2	4
4. Identify, measure, calculate, and analyze relationships associated with matter and energy transfer or transformations, and the associated conservation of mass	3	2	3	1	9
5. Explain the interactions between motions and forces, including (a) the laws of motion and (b) an understanding of the gravitational and electromagnetic forces			1		1
6. Explain how energy is stored, transferred, and transformed, including (a) the conservation of energy, (b) kinetic and potential energy and energy contained by a field, (c) heat energy and atomic and molecular motion, and (d) energy tends to change from concentrated to diffuse					
7. Describe how energy and matter interact, including (a) waves, (b) the electromagnetic spectrum, (c) quantization of energy, and (d) insulators and conductors		2			2

<b>Montana Science Content Standard 3</b> Students, through the inquiry process, demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.	HS-PS1-1.	HS-PS1-3.	HS-PS1-8.	HS-PS2-6.	Total
1. Investigate and use appropriate technology to demonstrate that cells have common features including differences that determine function and that they are composed of common building blocks (e.g., proteins, carbohydrates, nucleic acids, lipids)					
2. Describe and explain the complex processes involved in energy use in cell maintenance, growth, repair and development					
3. Model the structure of DNA and protein synthesis, discuss the molecular basis of heredity, and explain how it contributes to the diversity of life					
4. Predict and model the interaction of biotic and abiotic factors that affect populations through natural selection, and explain how this contributes to the evolution of species over time					
5. Generate and apply biological classification schemes to infer and discuss the degree of divergence between ecosystems					
<b>Montana Science Content Standard 4</b> Students, through the inquiry process, demonstrate knowledge of the composition, structures, processes and interactions of Earth's systems and other objects in space.	HS-PS1-1.	HS-PS1-3.	HS-PS1-8.	HS-PS2-6.	Total
1. Understand the theory of plate tectonics and how it explains the interrelationship between earthquakes, volcanoes, and sea floor spreading					
2. Identify and classify rocks and minerals based on physical and chemical properties and the utilization by humans (e.g., natural resources, building materials)					
3. Explain scientific theories about how fossils are used as evidence of changes over time					
4. Collect and analyze local and regional weather data to make inferences and predictions about weather patterns; explain factors influencing global weather patterns and climate; and describe the impact on earth of fluctuations in weather and climate (e.g., drought, surface and ground water, glacial instability)					
5. Explain the impact of terrestrial, solar, oceanic, and atmosphere conditions on global climatic patterns					
6. Describe the origin, location, and evolution of stars and their planetary systems in respect to the solar system, the Milky Way, the local galactic group, and the universe					
7. Relate how evidence from advanced technology applied to scientific investigations (e.g., large telescopes and spaceborne observatories), has dramatically impacted our understanding of the origin, size, and evolution of the universe					
<b>Montana Science Content Standard 5</b> Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.	HS-PS1-1.	HS-PS1-3.	HS-PS1-8.	HS-PS2-6.	Total
1. Predict how key factors (e.g., technology, competitiveness, and world events) affect the development and acceptance of scientific thought				1	1
2. Give examples of scientific innovation challenging commonly held perceptions					
3. Evaluate the ongoing, collaborative scientific process by gathering and critiquing information					
4. Analyze benefits, limitations, costs, consequences, and ethics involved in using scientific and technological innovations (e.g., biotechnology, environmental issues)		1		1	2
5. Explain how the knowledge of science and technology applies to contemporary Montana American Indian communities (e.g., natural resources development, management and conservation)					

<b><u>Montana Science Content Standard 6</u></b> Students understand historical developments in science and technology.	<b>HS- PS1- 1.</b>	<b>HS- PS1- 3.</b>	<b>HS- PS1- 8.</b>	<b>HS- PS2- 6.</b>	<b>Total</b>
1. Analyze and illustrate the historical impact of scientific and technological advances, including Montana American Indian examples					
2. Trace developments that demonstrate scientific knowledge is subject to change as new evidence becomes available				<b>1</b>	<b>1</b>
3. Describe, explain, and analyze science as a human endeavor and an ongoing process				<b>1</b>	<b>1</b>



## Chemical Reactions

<b>Total respondents:</b>	<b>7</b>
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<b>Montana Science Content Standard 1</b> Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate the results and form reasonable conclusions of scientific investigations.	<b>HS-PS1-2.</b>	<b>HS-PS1-4.</b>	<b>HS-PS1-5.</b>	<b>HS-PS1-6.</b>	<b>HS-PS1-7.</b>	<b>Total</b>
1. Generate a question, identify dependent and independent variables, formulate testable, multiple hypotheses, plan an investigation, predict its outcome, safely conduct the scientific investigations, and collect and analyze the data	1	1	1			3
2. Select and use appropriate tools including technology to make measurements (in metric units), gather, process and analyze data from scientific investigations using appropriate mathematical analysis, error analysis, and graphical representation					2	2
3. Review evidence, communicate and defend results, and recognize that the results of a scientific investigation are always open to revision by further investigations. (e.g. through graphical representation or charts)	1	1	1	1	1	5
4. Analyze observations and explain with scientific understanding to develop a plausible model (e.g., atom, expanding universe)	2	3	1	1	1	8
5. Identify strengths, weaknesses, and assess the validity of the experimental design of an investigation through analysis and evaluation	2	1	2	1	1	7
6. Explain how observations of nature form an essential base of knowledge among the Montana American Indians				1		1
<b>Montana Science Content Standard 2</b> Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	<b>HS-PS1-2.</b>	<b>HS-PS1-4.</b>	<b>HS-PS1-5.</b>	<b>HS-PS1-6.</b>	<b>HS-PS1-7.</b>	<b>Total</b>
1. Describe the structure of atoms, including knowledge of (a) subatomic particles and their relative masses, charges, and locations within the atom, (b) the electrical and nuclear forces that hold the atom together, (c) fission and fusion, and (d) radioactive	2	3	1		1	7
2. Explain how the particulate level structure and properties of matter affect its macroscopic properties, including the effect of (a) valence electrons on the chemical properties of elements and the resulting periodic trends in these properties, (b) chemical bonding, (c) molecular geometry and intermolecular forces, (d) kinetic molecular theory on phases of matter, and (e) carbon-carbon atom bonding on biomolecules	5	2	2	1	2	12
3. Describe the major features associated with chemical reactions, including (a) giving examples of reactions important to industry and living organisms, (b) energy changes associated with chemical changes, (c) classes of chemical reactions, (d) rates of reactions, and (e) the role of catalysts	5	4	4	4	3	20
4. Identify, measure, calculate, and analyze relationships associated with matter and energy transfer or transformations, and the associated conservation of mass	2	3	1	2	4	12
5. Explain the interactions between motions and forces, including (a) the laws of motion and (b) an understanding of the gravitational and electromagnetic forces		1	1	1	2	5
6. Explain how energy is stored, transferred, and transformed, including (a) the conservation of energy, (b) kinetic and potential energy and energy contained by a field, (c) heat energy and atomic and molecular motion, and (d) energy tends to change from concentrated to diffuse	1	3	4	2	1	11
7. Describe how energy and matter interact, including (a) waves, (b) the electromagnetic spectrum, (c) quantization of energy, and (d) insulators and conductors			1	1	2	4

<b><u>Montana Science Content Standard 3</u></b> Students, through the inquiry process, demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.	HS- PS1- 2.	HS- PS1- 4.	HS- PS1- 5.	HS- PS1- 6.	HS- PS1- 7.	Total
1. Investigate and use appropriate technology to demonstrate that cells have common features including differences that determine function and that they are composed of common building blocks (e.g., proteins, carbohydrates, nucleic acids, lipids)						
2. Describe and explain the complex processes involved in energy use in cell maintenance, growth, repair and development						
3. Model the structure of DNA and protein synthesis, discuss the molecular basis of heredity, and explain how it contributes to the diversity of life						
4. Predict and model the interaction of biotic and abiotic factors that affect populations through natural selection, and explain how this contributes to the evolution of species over time						
5. Generate and apply biological classification schemes to infer and discuss the degree of divergence between ecosystems						
<b><u>Montana Science Content Standard 4</u></b> Students, through the inquiry process, demonstrate knowledge of the composition, structures, processes and interactions of Earth's systems and other objects in space.	HS- PS1- 2.	HS- PS1- 4.	HS- PS1- 5.	HS- PS1- 6.	HS- PS1- 7.	Total
1. Understand the theory of plate tectonics and how it explains the interrelationship between earthquakes, volcanoes, and sea floor spreading						
2. Identify and classify rocks and minerals based on physical and chemical properties and the utilization by humans (e.g., natural resources, building materials)						
3. Explain scientific theories about how fossils are used as evidence of changes over time						
4. Collect and analyze local and regional weather data to make inferences and predictions about weather patterns; explain factors influencing global weather patterns and climate; and describe the impact on earth of fluctuations in weather and climate (e.g., drought, surface and ground water, glacial instability)						
5. Explain the impact of terrestrial, solar, oceanic, and atmosphere conditions on global climatic patterns						
6. Describe the origin, location, and evolution of stars and their planetary systems in respect to the solar system, the Milky Way, the local galactic group, and the universe						
7. Relate how evidence from advanced technology applied to scientific investigations (e.g., large telescopes and spaceborne observatories), has dramatically impacted our understanding of the origin, size, and evolution of the universe						
<b><u>Montana Science Content Standard 5</u></b> Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.	HS- PS1- 2.	HS- PS1- 4.	HS- PS1- 5.	HS- PS1- 6.	HS- PS1- 7.	Total
1. Predict how key factors (e.g., technology, competitiveness, and world events) affect the development and acceptance of scientific thought						
2. Give examples of scientific innovation challenging commonly held perceptions						
3. Evaluate the ongoing, collaborative scientific process by gathering and critiquing information						
4. Analyze benefits, limitations, costs, consequences, and ethics involved in using scientific and technological innovations (e.g., biotechnology, environmental issues)						
5. Explain how the knowledge of science and technology applies to contemporary Montana American Indian communities (e.g., natural resources development, management and conservation)						



<b><u>Montana Science Content Standard 6</u></b> Students understand historical developments in science and technology.	<b>HS- PS1- 2.</b>	<b>HS- PS1- 4.</b>	<b>HS- PS1- 5.</b>	<b>HS- PS1- 6.</b>	<b>HS- PS1- 7.</b>	<b>Total</b>
1. Analyze and illustrate the historical impact of scientific and technological advances, including Montana American Indian examples						
2. Trace developments that demonstrate scientific knowledge is subject to change as new evidence becomes available						
3. Describe, explain, and analyze science as a human endeavor and an ongoing process						



## Forces and Interactions

<b>Total respondents:</b>	4
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<b>Montana Science Content Standard 1</b> Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate the results and form reasonable conclusions of scientific investigations.	HS-PS2-1.	HS-PS2-2.	HS-PS2-3.	HS-PS2-4.	HS-PS2-5.	Total
1. Generate a question, identify dependent and independent variables, formulate testable, multiple hypotheses, plan an investigation, predict its outcome, safely conduct the scientific investigations, and collect and analyze the data	1		2		2	5
2. Select and use appropriate tools including technology to make measurements (in metric units), gather, process and analyze data from scientific investigations using appropriate mathematical analysis, error analysis, and graphical representation	3	3	1	2	1	10
3. Review evidence, communicate and defend results, and recognize that the results of a scientific investigation are always open to revision by further investigations. (e.g. through graphical representation or charts)	1		2			3
4. Analyze observations and explain with scientific understanding to develop a plausible model (e.g., atom, expanding universe)	2		2	1		5
5. Identify strengths, weaknesses, and assess the validity of the experimental design of an investigation through analysis and evaluation	1		3	2		6
6. Explain how observations of nature form an essential base of knowledge among the Montana American Indians			1			1
<b>Montana Science Content Standard 2</b> Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	HS-PS2-1.	HS-PS2-2.	HS-PS2-3.	HS-PS2-4.	HS-PS2-5.	Total
1. Describe the structure of atoms, including knowledge of (a) subatomic particles and their relative masses, charges, and locations within the atom, (b) the electrical and nuclear forces that hold the atom together, (c) fission and fusion, and (d) radioactive	1			1		2
2. Explain how the particulate level structure and properties of matter affect its macroscopic properties, including the effect of (a) valence electrons on the chemical properties of elements and the resulting periodic trends in these properties, (b) chemical bonding, (c) molecular geometry and intermolecular forces, (d) kinetic molecular theory on phases of matter, and (e) carbon-carbon atom bonding on biomolecules	1			1		2
3. Describe the major features associated with chemical reactions, including (a) giving examples of reactions important to industry and living organisms, (b) energy changes associated with chemical changes, (c) classes of chemical reactions, (d) rates of reactions, and (e) the role of catalysts						
4. Identify, measure, calculate, and analyze relationships associated with matter and energy transfer or transformations, and the associated conservation of mass		1	1	1		3
5. Explain the interactions between motions and forces, including (a) the laws of motion and (b) an understanding of the gravitational and electromagnetic forces	3	3	3	3	2	14
6. Explain how energy is stored, transferred, and transformed, including (a) the conservation of energy, (b) kinetic and potential energy and energy contained by a field, (c) heat energy and atomic and molecular motion, and (d) energy tends to change from concentrated to diffuse		1	2	1	2	6
7. Describe how energy and matter interact, including (a) waves, (b) the electromagnetic spectrum, (c) quantization of energy, and (d) insulators and conductors		1	1	1		3

<b>Montana Science Content Standard 3</b> Students, through the inquiry process, demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.	HS- PS2- 1.	HS- PS2- 2.	HS- PS2- 3.	HS- PS2- 4.	HS- PS2- 5.	Total
1. Investigate and use appropriate technology to demonstrate that cells have common features including differences that determine function and that they are composed of common building blocks (e.g., proteins, carbohydrates, nucleic acids, lipids)						
2. Describe and explain the complex processes involved in energy use in cell maintenance, growth, repair and development						
3. Model the structure of DNA and protein synthesis, discuss the molecular basis of heredity, and explain how it contributes to the diversity of life						
4. Predict and model the interaction of biotic and abiotic factors that affect populations through natural selection, and explain how this contributes to the evolution of species over time						
5. Generate and apply biological classification schemes to infer and discuss the degree of divergence between ecosystems						
<b>Montana Science Content Standard 4</b> Students, through the inquiry process, demonstrate knowledge of the composition, structures, processes and interactions of Earth's systems and other objects in space.	HS- PS2- 1.	HS- PS2- 2.	HS- PS2- 3.	HS- PS2- 4.	HS- PS2- 5.	Total
1. Understand the theory of plate tectonics and how it explains the interrelationship between earthquakes, volcanoes, and sea floor spreading						
2. Identify and classify rocks and minerals based on physical and chemical properties and the utilization by humans (e.g., natural resources, building materials)						
3. Explain scientific theories about how fossils are used as evidence of changes over time						
4. Collect and analyze local and regional weather data to make inferences and predictions about weather patterns; explain factors influencing global weather patterns and climate; and describe the impact on earth of fluctuations in weather and climate (e.g., drought, surface and ground water, glacial instability)						
5. Explain the impact of terrestrial, solar, oceanic, and atmosphere conditions on global climatic patterns						
6. Describe the origin, location, and evolution of stars and their planetary systems in respect to the solar system, the Milky Way, the local galactic group, and the universe						
7. Relate how evidence from advanced technology applied to scientific investigations (e.g., large telescopes and spaceborne observatories), has dramatically impacted our understanding of the origin, size, and evolution of the universe						
<b>Montana Science Content Standard 5</b> Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.	HS- PS2- 1.	HS- PS2- 2.	HS- PS2- 3.	HS- PS2- 4.	HS- PS2- 5.	Total
1. Predict how key factors (e.g., technology, competitiveness, and world events) affect the development and acceptance of scientific thought						
2. Give examples of scientific innovation challenging commonly held perceptions			1			1
3. Evaluate the ongoing, collaborative scientific process by gathering and critiquing information	2	1	2	2	1	8
4. Analyze benefits, limitations, costs, consequences, and ethics involved in using scientific and technological innovations (e.g., biotechnology, environmental issues)	1		2	1		4
5. Explain how the knowledge of science and technology applies to contemporary Montana American Indian communities (e.g., natural resources development, management and conservation)	1			1		2

<b><u>Montana Science Content Standard 6</u></b> Students understand historical developments in science and technology.	<b>HS- PS2- 1.</b>	<b>HS- PS2- 2.</b>	<b>HS- PS2- 3.</b>	<b>HS- PS2- 4.</b>	<b>HS- PS2- 5.</b>	<b>Total</b>
1. Analyze and illustrate the historical impact of scientific and technological advances, including Montana American Indian examples						
2. Trace developments that demonstrate scientific knowledge is subject to change as new evidence becomes available	<b>1</b>			<b>1</b>		<b>2</b>
3. Describe, explain, and analyze science as a human endeavor and an ongoing process	<b>1</b>			<b>1</b>		<b>2</b>

## Energy

<b>Total respondents:</b>	5
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<b>Montana Science Content Standard 1</b> Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate the results and form reasonable conclusions of scientific investigations.	HS-PS3-1.	HS-PS3-2.	HS-PS3-3.	HS-PS3-4.	HS-PS3-5.	Total
1. Generate a question, identify dependent and independent variables, formulate testable, multiple hypotheses, plan an investigation, predict its outcome, safely conduct the scientific investigations, and collect and analyze the data			1	2	1	4
2. Select and use appropriate tools including technology to make measurements (in metric units), gather, process and analyze data from scientific investigations using appropriate mathematical analysis, error analysis, and graphical representation	2		2	1		5
3. Review evidence, communicate and defend results, and recognize that the results of a scientific investigation are always open to revision by further investigations. (e.g. through graphical representation or charts)		1	2	3	1	7
4. Analyze observations and explain with scientific understanding to develop a plausible model (e.g., atom, expanding universe)	1	4	2		4	11
5. Identify strengths, weaknesses, and assess the validity of the experimental design of an investigation through analysis and evaluation		1	2	3	1	7
6. Explain how observations of nature form an essential base of knowledge among the Montana American Indians						
<b>Montana Science Content Standard 2</b> Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	HS-PS3-1.	HS-PS3-2.	HS-PS3-3.	HS-PS3-4.	HS-PS3-5.	Total
1. Describe the structure of atoms, including knowledge of (a) subatomic particles and their relative masses, charges, and locations within the atom, (b) the electrical and nuclear forces that hold the atom together, (c) fission and fusion, and (d) radioactive		1			1	2
2. Explain how the particulate level structure and properties of matter affect its macroscopic properties, including the effect of (a) valence electrons on the chemical properties of elements and the resulting periodic trends in these properties, (b) chemical bonding, (c) molecular geometry and intermolecular forces, (d) kinetic molecular theory on phases of matter, and (e) carbon-carbon atom bonding on biomolecules	1	1		1	1	4
3. Describe the major features associated with chemical reactions, including (a) giving examples of reactions important to industry and living organisms, (b) energy changes associated with chemical changes, (c) classes of chemical reactions, (d) rates of reactions, and (e) the role of catalysts	1	1	3	1	1	7
4. Identify, measure, calculate, and analyze relationships associated with matter and energy transfer or transformations, and the associated conservation of mass	2	1	2	1	2	8
5. Explain the interactions between motions and forces, including (a) the laws of motion and (b) an understanding of the gravitational and electromagnetic forces	2	2	1	2	2	9
6. Explain how energy is stored, transferred, and transformed, including (a) the conservation of energy, (b) kinetic and potential energy and energy contained by a field, (c) heat energy and atomic and molecular motion, and (d) energy tends to change from concentrated to diffuse	4	4	3	3	2	16
7. Describe how energy and matter interact, including (a) waves, (b) the electromagnetic spectrum, (c) quantization of energy, and (d) insulators and conductors	3	3	3		1	10

<b>Montana Science Content Standard 3</b> Students, through the inquiry process, demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.	HS-PS3-1.	HS-PS3-2.	HS-PS3-3.	HS-PS3-4.	HS-PS3-5.	Total
1. Investigate and use appropriate technology to demonstrate that cells have common features including differences that determine function and that they are composed of common building blocks (e.g., proteins, carbohydrates, nucleic acids, lipids)		1		1	1	3
2. Describe and explain the complex processes involved in energy use in cell maintenance, growth, repair and development						
3. Model the structure of DNA and protein synthesis, discuss the molecular basis of heredity, and explain how it contributes to the diversity of life						
4. Predict and model the interaction of biotic and abiotic factors that affect populations through natural selection, and explain how this contributes to the evolution of species over time						
5. Generate and apply biological classification schemes to infer and discuss the degree of divergence between ecosystems						
<b>Montana Science Content Standard 4</b> Students, through the inquiry process, demonstrate knowledge of the composition, structures, processes and interactions of Earth's systems and other objects in space.	HS-PS3-1.	HS-PS3-2.	HS-PS3-3.	HS-PS3-4.	HS-PS3-5.	Total
1. Understand the theory of plate tectonics and how it explains the interrelationship between earthquakes, volcanoes, and sea floor spreading		1	1		1	3
2. Identify and classify rocks and minerals based on physical and chemical properties and the utilization by humans (e.g., natural resources, building materials)						
3. Explain scientific theories about how fossils are used as evidence of changes over time						
4. Collect and analyze local and regional weather data to make inferences and predictions about weather patterns; explain factors influencing global weather patterns and climate; and describe the impact on earth of fluctuations in weather and climate (e.g., drought, surface and ground water, glacial instability)						
5. Explain the impact of terrestrial, solar, oceanic, and atmosphere conditions on global climatic patterns						
6. Describe the origin, location, and evolution of stars and their planetary systems in respect to the solar system, the Milky Way, the local galactic group, and the universe	1					1
7. Relate how evidence from advanced technology applied to scientific investigations (e.g., large telescopes and spaceborne observatories), has dramatically impacted our understanding of the origin, size, and evolution of the universe	1					1
<b>Montana Science Content Standard 5</b> Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.	HS-PS3-1.	HS-PS3-2.	HS-PS3-3.	HS-PS3-4.	HS-PS3-5.	Total
1. Predict how key factors (e.g., technology, competitiveness, and world events) affect the development and acceptance of scientific thought	1					1
2. Give examples of scientific innovation challenging commonly held perceptions	1		1			2
3. Evaluate the ongoing, collaborative scientific process by gathering and critiquing information	1		1	1		3
4. Analyze benefits, limitations, costs, consequences, and ethics involved in using scientific and technological innovations (e.g., biotechnology, environmental issues)	1		3	1		5
5. Explain how the knowledge of science and technology applies to contemporary Montana American Indian communities (e.g., natural resources development, management and conservation)			1			1

<b><u>Montana Science Content Standard 6</u></b> Students understand historical developments in science and technology.	<b>HS- PS3- 1.</b>	<b>HS- PS3- 2.</b>	<b>HS- PS3- 3.</b>	<b>HS- PS3- 4.</b>	<b>HS- PS3- 5.</b>	<b>Total</b>
1. Analyze and illustrate the historical impact of scientific and technological advances, including Montana American Indian examples						
2. Trace developments that demonstrate scientific knowledge is subject to change as new evidence becomes available						
3. Describe, explain, and analyze science as a human endeavor and an ongoing process			<b>1</b>			<b>1</b>





## Waves and Electromagnetic Radiation

<b>Total respondents:</b>	5
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<b>Montana Science Content Standard 1</b> Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate the results and form reasonable conclusions of scientific investigations.	HS-PS4-1.	HS-PS4-2.	HS-PS4-3.	HS-PS4-4.	HS-PS4-5.	Total
1. Generate a question, identify dependent and independent variables, formulate testable, multiple hypotheses, plan an investigation, predict its outcome, safely conduct the scientific investigations, and collect and analyze the data	1	4			1	6
2. Select and use appropriate tools including technology to make measurements (in metric units), gather, process and analyze data from scientific investigations using appropriate mathematical analysis, error analysis, and graphical representation	4	2		1		7
3. Review evidence, communicate and defend results, and recognize that the results of a scientific investigation are always open to revision by further investigations. (e.g. through graphical representation or charts)	3	3	4	2	3	15
4. Analyze observations and explain with scientific understanding to develop a plausible model (e.g., atom, expanding universe)	3	2	5			10
5. Identify strengths, weaknesses, and assess the validity of the experimental design of an investigation through analysis and evaluation	1		4	3	1	9
6. Explain how observations of nature form an essential base of knowledge among the Montana American Indians						
<b>Montana Science Content Standard 2</b> Students, through the inquiry process, demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.	HS-PS4-1.	HS-PS4-2.	HS-PS4-3.	HS-PS4-4.	HS-PS4-5.	Total
1. Describe the structure of atoms, including knowledge of (a) subatomic particles and their relative masses, charges, and locations within the atom, (b) the electrical and nuclear forces that hold the atom together, (c) fission and fusion, and (d) radioactive						
2. Explain how the particulate level structure and properties of matter affect its macroscopic properties, including the effect of (a) valence electrons on the chemical properties of elements and the resulting periodic trends in these properties, (b) chemical bonding, (c) molecular geometry and intermolecular forces, (d) kinetic molecular theory on phases of matter, and (e) carbon-carbon atom bonding on biomolecules						
3. Describe the major features associated with chemical reactions, including (a) giving examples of reactions important to industry and living organisms, (b) energy changes associated with chemical changes, (c) classes of chemical reactions, (d) rates of reactions, and (e) the role of catalysts						
4. Identify, measure, calculate, and analyze relationships associated with matter and energy transfer or transformations, and the associated conservation of mass	1		2		1	4
5. Explain the interactions between motions and forces, including (a) the laws of motion and (b) an understanding of the gravitational and electromagnetic forces			1	1	1	3
6. Explain how energy is stored, transferred, and transformed, including (a) the conservation of energy, (b) kinetic and potential energy and energy contained by a field, (c) heat energy and atomic and molecular motion, and (d) energy tends to change from concentrated to diffuse		1	3	2	4	10
7. Describe how energy and matter interact, including (a) waves, (b) the electromagnetic spectrum, (c) quantization of energy, and (d) insulators and conductors	5		4	3	3	15

<b>Montana Science Content Standard 3</b> Students, through the inquiry process, demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.	HS-PS4-1.	HS-PS4-2.	HS-PS4-3.	HS-PS4-4.	HS-PS4-5.	Total
1. Investigate and use appropriate technology to demonstrate that cells have common features including differences that determine function and that they are composed of common building blocks (e.g., proteins, carbohydrates, nucleic acids, lipids)						
2. Describe and explain the complex processes involved in energy use in cell maintenance, growth, repair and development						
3. Model the structure of DNA and protein synthesis, discuss the molecular basis of heredity, and explain how it contributes to the diversity of life						
4. Predict and model the interaction of biotic and abiotic factors that affect populations through natural selection, and explain how this contributes to the evolution of species over time						
5. Generate and apply biological classification schemes to infer and discuss the degree of divergence between ecosystems						
<b>Montana Science Content Standard 4</b> Students, through the inquiry process, demonstrate knowledge of the composition, structures, processes and interactions of Earth's systems and other objects in space.	HS-PS4-1.	HS-PS4-2.	HS-PS4-3.	HS-PS4-4.	HS-PS4-5.	Total
1. Understand the theory of plate tectonics and how it explains the interrelationship between earthquakes, volcanoes, and sea floor spreading						
2. Identify and classify rocks and minerals based on physical and chemical properties and the utilization by humans (e.g., natural resources, building materials)						
3. Explain scientific theories about how fossils are used as evidence of changes over time						
4. Collect and analyze local and regional weather data to make inferences and predictions about weather patterns; explain factors influencing global weather patterns and climate; and describe the impact on earth of fluctuations in weather and climate (e.g., drought, surface and ground water, glacial instability)						
5. Explain the impact of terrestrial, solar, oceanic, and atmosphere conditions on global climatic patterns						
6. Describe the origin, location, and evolution of stars and their planetary systems in respect to the solar system, the Milky Way, the local galactic group, and the universe						
7. Relate how evidence from advanced technology applied to scientific investigations (e.g., large telescopes and spaceborne observatories), has dramatically impacted our understanding of the origin, size, and evolution of the universe						
<b>Montana Science Content Standard 5</b> Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.	HS-PS4-1.	HS-PS4-2.	HS-PS4-3.	HS-PS4-4.	HS-PS4-5.	Total
1. Predict how key factors (e.g., technology, competitiveness, and world events) affect the development and acceptance of scientific thought	1	2			3	6
2. Give examples of scientific innovation challenging commonly held perceptions		1	1	1	1	4
3. Evaluate the ongoing, collaborative scientific process by gathering and critiquing information		1	1	2		4
4. Analyze benefits, limitations, costs, consequences, and ethics involved in using scientific and technological innovations (e.g., biotechnology, environmental issues)		1			1	2
5. Explain how the knowledge of science and technology applies to contemporary Montana American Indian communities (e.g., natural resources development, management and conservation)					1	1

<b><u>Montana Science Content Standard 6</u></b> Students understand historical developments in science and technology.	<b>HS- PS4- 1.</b>	<b>HS- PS4- 2.</b>	<b>HS- PS4- 3.</b>	<b>HS- PS4- 4.</b>	<b>HS- PS4- 5.</b>	<b>Total</b>
1. Analyze and illustrate the historical impact of scientific and technological advances, including Montana American Indian examples		2			1	3
2. Trace developments that demonstrate scientific knowledge is subject to change as new evidence becomes available		2	2			4
3. Describe, explain, and analyze science as a human endeavor and an ongoing process		1	2		1	4